

IMPACT OF FLIPPED CLASSROOM ON FIRST MBBS STUDENTS IN RENAL PHYSIOLOGY.

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Abstract

Introduction: Teaching by “flipped classroom” approach is evolving in medical science where students attempt significant pre-class preparations, while classroom time is utilized to achieve deeper levels of knowledge of the relevant topics.

Aim: To implement flipped classroom teaching method and to comprehend, analyze and evaluate the impact of this method in first MBBS students.

Settings and Design: 100 first MBBS students of Ashwini Rural Medical College, Solapur. It's a cross-sectional observational study

Methods and Material: Study group comprised of 100 students, who were divided into two groups. Group-1 was exposed to flipped classroom (FCR) teaching method and Group-2 was subjected to traditional classroom teaching by same faculty. Study material like power-point presentations, links for the video lectures and page numbers of standard textbooks of the topics to be taught were shared with students belonging to FCR group. Pre-test was taken from both the groups before beginning of study. Classroom time was utilised for making students achieve deeper knowledge and understanding by self-directed learning methods for FCR group while non-FCR group was taught by didactic lecture sessions. Evaluation was done by post-test. Students belonging to FCR group were asked to give feedback about FCR teaching method.

Statistical analysis: Comparison of scores of pre and post-test was done between both the groups by using t-test. (p-value < 0.05-significant).

Results: The average score comparison of pre-test between group-1 and group-2 was not significant which depicts no intellectual difference between both groups whereas average score comparison of post-test between group-1 and group-2 was highly significant. The average marks scored in post-test were highly significant than the marks so scored in pre-test for group-1, whereas in group-2, the average marks scored in post-test were only significant than the marks scored in pre-test. Students strongly agreed that they were able to understand the topic effectively and FCR was an interesting experience for learning.

Conclusions: The present study resulted in improved student's performance in FCR group hence it gives us an insight that FCR would be a potential and greater educational tool for facilitators to help students reach deeper understanding of topics along with relevant exposure to different ways of pedagogy.

Keywords: Flipped Class room, Pedagogy, Active learning, Renal Physiology

Introduction

Medical education is shifting from traditional classroom teaching to Competency Based Medical Education that focuses on active learning & deeper levels of domains in pedagogy (adult learning). Traditional method of teaching focuses on the knowledge level or tests only memory level of cognitive domain of Bloom's taxonomy in didactic lectures.

Medical faculty continuously struggles and engages themselves in brain storming sessions with different departments to design time-table that can fulfil all points of CBME curriculum like horizontal & vertical integration, alignments, Self-directed learning, Early clinical exposure which can test all three domains of learning. Self-directed

learning can be conducted in various ways. One of the ways to conduct SDL which helps active & deeper learning in students is flipping the classroom.

Generally, after designing the time-table weekly teaching schedule is displayed on notice board for students so that they can read before class and have a general idea about the topic to be taught in the class, but this hardly happens as most of the students do not read the topic before-hand. So, to motivate and guide students to read before the class, one of the best approaches for pedagogy is the emerging concept of flipped classroom.

“Flipping the classroom means that students gain knowledge of the topic to be taught before class, usually via reading or watching lecture videos, and then use class time to do the harder work of assimilating that knowledge,

through problem-solving, discussion, seminar or debates in the presence of instructor or facilitator”⁽¹⁾. The model was popularized by Eric Mazur claiming that the learning gains are nearly tripled with this approach that focuses on the student and interactive learning⁽²⁾.

Karl Fisch in 2008 created a video “Shift Happens” and was credited for coining term as “Fisch Flip” and “Flipped Classroom.” With the growth of technology, pre-class assignment is usually delivered via video lecture; however, many other innovations have been experimented upon, implemented and evaluated. The flipped classroom approach, though used for years in humanities, has now found its way into medical education⁽³⁾. There is a felt need to enable a fresh graduate to develop the key competencies so as to deliver socially responsive health care⁽⁴⁾.

In reality, this modality has long been used in non-science courses, but recently this approach is also emerging in medical stream as one of the pedagogical approaches. Medical education is shifting from traditional teaching to competency-based training. One of the skills required for competency based medical education is cultivating the habit of self-directed learning.

It is essential to determine whether incorporating flipped classroom approach actually increases student learning gains⁽⁵⁾. Hence our study was designed to introduce the concept of flipped classroom in students and study its impact on students.

Aims and objectives: Our present study was devised to introduce the concept of flipped classroom in students, comprehend, assess, analyze and evaluate the impact of use of flipped classroom, compare flipped classroom teaching method with that of traditional teaching method.

Methods and Material:

The participants for this study were first MBBS students admitted in Ashwini Rural Medical College, Hospital and Research Centre, Solapur. Total of 100 students were involved in the systematically planned renal physiology module. Inclusion criteria: Students who voluntarily gave written and informed consent were included in the study group. Exclusion criteria: Students who were absent on the day of the study were excluded. Incomplete quiz or feedback questionnaire were excluded. However, as none of the students were absent on the days of study, all 100 students were included in the study population. Institutional ethical clearance was obtained before the conduct of the study.

100 students were divided in two equal groups. Group 1 consisted of 50 students randomly selected and subjected to flipped classroom type of adult learning while the other

50 students were allocated as Group 2 who were exposed to only traditional teaching methods by same facilitator.

Systematically planned conduct of flipped classroom and traditional didactic lectures session were endorsed in renal physiology module included 10 topics (one in each session):

1. Structural and functional anatomy of kidney
2. Renal blood flow and circulation
3. Glomerular filtration rate and factors affecting it
4. Juxta glomerular apparatus and its functions
5. Tubular functions of nephron
6. Counter current mechanism for concentration and dilution of kidney
7. Control of ECF osmolarity and sodium concentration
8. Micturition reflex
9. Acid-base balance
10. Artificial kidney and dialysis

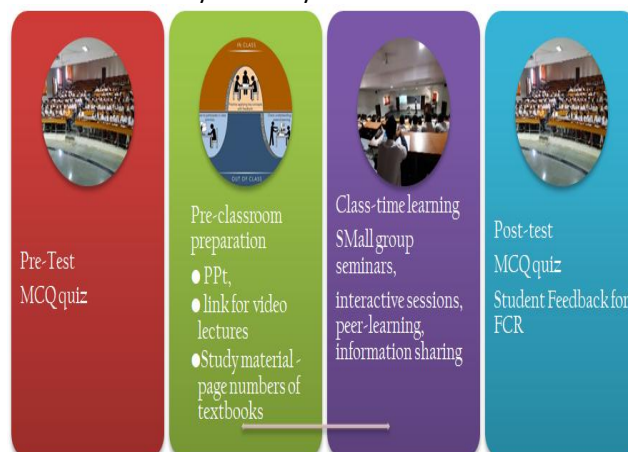


Figure 1:

Pre-test in the form of paper based multiple choice questions were administered to both groups before beginning of the study. Study material in the form of power-point presentation, links for the video lectures along with page numbers of the topics to be studied from standard textbook of physiology (viz Guyton & Hall and Ganong) was allotted to group-1 students (FCR group). 10 above mentioned topics were allotted to 50 students of FCR group wherein 1 topic was allotted to a group of 5 students. These students presented those topics so allotted to them in a form of seminar in presence of the instructor or facilitator. The facilitator allotted to students actively participated in problem-solving sessions and engaged them in deeper level of understanding, evaluating and analysing the topic. Group 2 students (Non-FCR group) were taught the same topic by same facilitator on the same day at a different timing by traditional didactic lecture method. At the end of the study post-test was administered. Care was taken to ensure that MCQ questions were not repeated on the formal examinations.

A survey of student perspectives regarding the flipped classroom model was also obtained at the end of the course from Group 1 (FCR) based on 5-point Likert scale (1-Strongly disagree to 5-Strongly agree) in the form of feedback questionnaire of the sessions for renal physiology module.

Statistical Analysis: Data collected was analyzed using SPSS software. Descriptive statistics such as mean, standard deviation was used. Comparison of scores between FRC group and Non-FRC group were done. Pre and post-test comparison between both the groups was done by using t-test. A p-value less than 0.05 were considered as significant.

Results: Quantitative analysis was done using objective questionnaire in form of multiple-choice questionnaire.

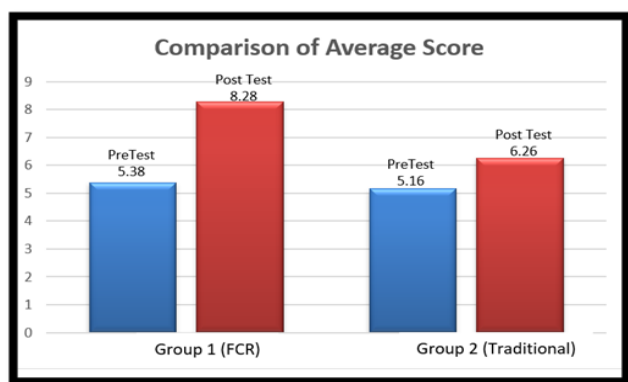


Figure 2:

The average score comparison of post-test between group 1 and group 2 was highly significant whereas average score of pre-test between group 1 and group2 was not significant.

In group-1 (FCR), the increase in average marks scored in post-test was highly significant than the marks so scored in pre-test.

In group-2 (Traditional), the average improvement of marks scored in post-test was only significant than marks scored in pre-test

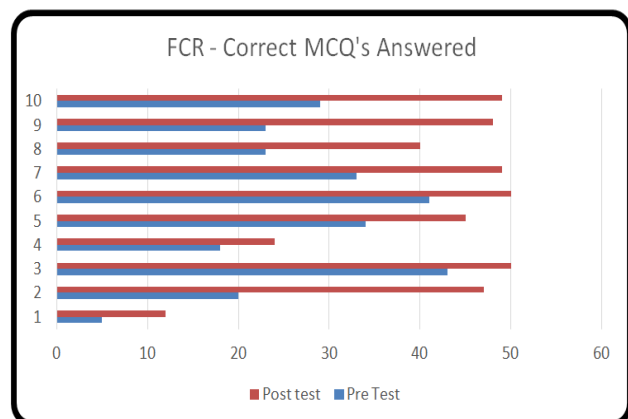


Figure 3:

There was highly significant increase in the number of correct answers marked in post-test by students of Group 1 (FCR).

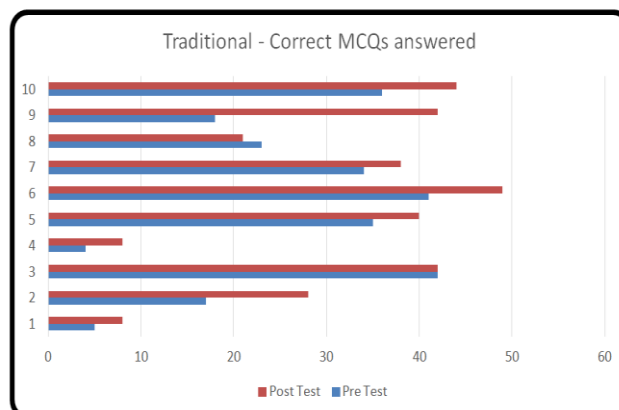


Figure 4:

The number of correct answers marked by students in post-test of group 2 were only significantly improved.

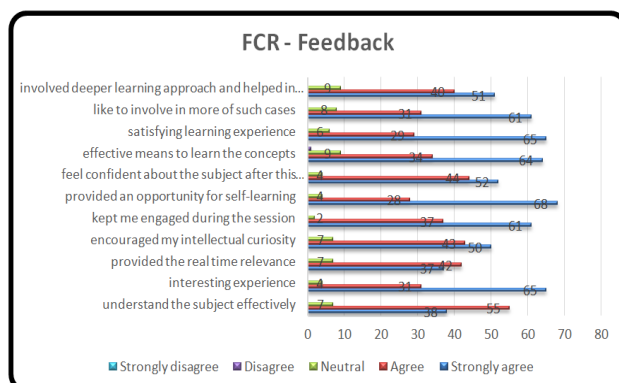


Figure 5:

The survey conducted after the post-test in form of feedback for FCR group showed some promising results. 55% of students agreed and 38% students strongly agreed that they were able to understand the topic effectively while 65% strongly agreed that FCR was an interesting experience for learning. 42% students agreed and 37% strongly agreed that this method of teaching provided them real-time relevance. 50-64% of students agreed or strongly agreed that it encouraged their intellectual activity, provided an opportunity for self-directed learning, felt confident about the system after the FCR classes, learnt the concepts easily.

65% of students strongly agreed that they were satisfied by this novel type of learning experience and 61% strongly agreed to involve more of such cases in further teaching classes as they felt it involved deeper learning approach to the newer systems and topics.

51% of students involved in FCR agreed that it helped in deeper learning approach and helped in critical thinking.

Discussion:

Our study, the flipped classroom teaching method for a renal physiology module was used to compare with that of the instructor dominated traditional classroom teaching by making two groups. It was implemented in three phases as pre-test, classroom learning in both groups viz group-1 (FCR), group-2 (Traditional) and post-test assessment with feedback from FCR group.

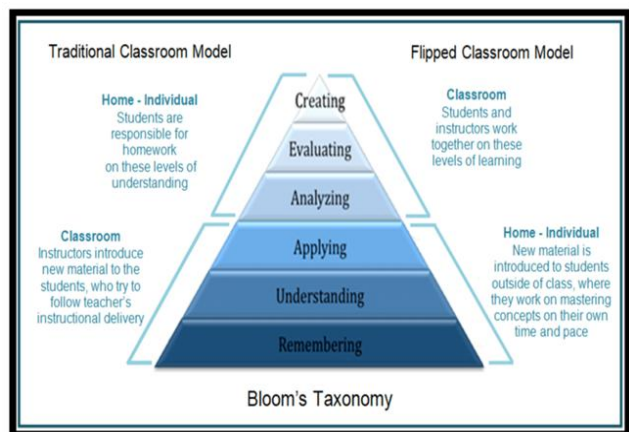


Figure 6:

FCR teaching focused on self-directed learning as a part of pedagogy (learner centric method) according to Blooms taxonomy as described in the above diagram (Fig.6) ⁽⁶⁾. In our study, FCR group students read the allocated topic, went through ppts, watched video lectures shared through links as a pre-classroom assignment. Utmost care was also taken in classroom time to see that students have understood the topic, had no queries and achieved deeper levels of cognition and were motivated enough to achieve the analysis and application aspect in each session. This helped them to acquire learning skills through critical thinking and improvised the communication skills of students.

The traditional method of didactic teaching, students are less actively involved and there is less focus onto the communication skills and analysis aspect of the topic as a whole ⁽⁶⁾. This happens because analysis and evaluation of knowledge is done in post classroom sessions usually at home when the students are alone as in contrast to FCR teaching wherein the application, analysis and evaluation happens in classroom itself along with the peers and instructor / facilitator. Walvoord and Anderson (7) proposed a model in which students gain first-exposure learning prior to class and focus on the processing part of learning (synthesizing, analyzing, problem-solving, etc.) in the class which is in concurrence with our study done. Similar studies were conducted by Kuldeep Singh et al ⁽⁸⁾ in medical students wherein the inverted classrooms have proved to be more satisfying for both instructors and students. Study by Mortensen et al ⁽⁹⁾ on undergraduate

students of equine sciences course proved to be a positive learning experience for students. Another study done by Richard Pierce et al ⁽¹⁰⁾ in students of school of pharmacy, to teach them renal pharmacotherapy module, which resulted in improved students' performance and favorable students' perception of the topic. The study done by Sarah McLean et al ⁽¹¹⁾ also proved that flipped classroom is not just for surface gains but has potential for greater educational gains than the traditional classroom method. She reported that students also developed independent learning strategies and are engaged in deep and active learning. Important study done by Sumangala P Rao et al ⁽¹²⁾ proved that academic performance is enhanced by using FCR in respiratory physiology examination. Morton DA et al ⁽¹³⁾ did find that for students of neurobiology and anatomy flipped class may benefit better retention when students are expected to analyse the material. Effectiveness of flipped classroom was studied by Kumar Shiva Gubbiyappa et al ⁽¹⁴⁾ in school of pharmacy, which revealed that FCR activity with poll-everywhere is an effective teaching-learning method.

Our study helps to support the view that FCR method has great impact on students understanding and performance where the quality of student-teacher interaction is a driving force for improvement in performance of the student. Furthermore, it develops student's tendency towards lifelong learning and demonstrates effectiveness of use of newer techniques in teaching-learning methodology.

Conclusion and suggestions:

As medical education is ever-changing from traditional classroom teaching (passive learning) to competency based interactive sessions, it is much needed to incorporate self-directed learning as part of competency based medical education for adult-learning.

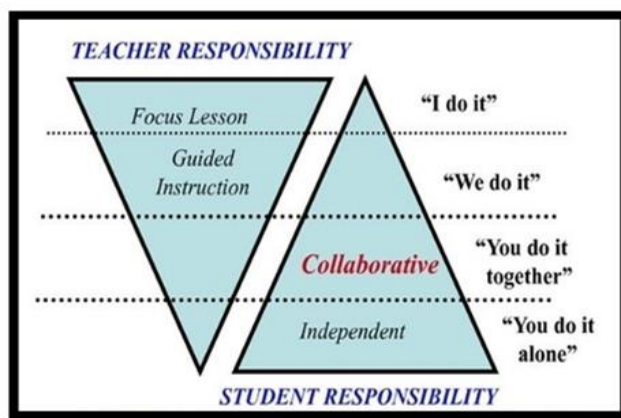


Figure 7:

Our study concludes that FCR teaching improves student's performance, learning gains and helps them to retain the topics better. As explained by the diagram above (Fig.7)

⁽¹⁵⁾, this improvement is because students focus onto the independent and collaborative responsibilities in the pre-classroom time with the help of digital tools and lecture materials provided by the facilitator. In classroom time, facilitator monitors, guides and solve queries of students in class and their active learning is incorporated. A flipped classroom model has promoted student-centred active learning by inculcating creative thinking, judgment, interpretation and problem-solving skills. This fostered cognitive skills like stages of synthesis, analysis and evaluation. It helped develop communication skills and boosts the confidence of students. FCR also helped students understand topic more effectively, arouse interest, encouraged their intellectual activity as they were actively involved in learning. This also influenced retention of topics when expected to analyze the given teaching-learning material which was reflected through post test results of FCR group.

However, there is very little documentation of the effectiveness of active-learning strategies but slowly flipped classroom is paving its way into medical education and facilitators are devising newer methods and impart maximum knowledge to medical students. The research on this newer method is still lacking due to intricacies in learning.

So, our study has guided us into a direction for use of incorporation of active learning by flipped classroom method to be included as an effective method of medical education. Students might dislike initially the newer methods but a good facilitator would be able to steer students in right direction forward with FCR along with a blend of traditional methods of learning. Also, to make the study more relevant and effective, the concept of flipped classroom teaching method can be imparted in different institutes and compare their results.

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